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Trebovaniya promyshlennosti k kachestvu mineral'nogo syr'ya,
Vypusk 41, litay, published by All-Union Scientific Research
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USSR LITHIUM RESOURCES

E. P. Libman

The presence of lithium in large or small amounts has been established in 140 minerals. However, the number of lithium minerals of industrial significance is limited to four: lepidolite, spodumene, zinnwaldite, and amblygonite.

Appreciable concentrations of lithium occur in three types of deposits.

The first type is characterized by granitic pegmatites and is represented in the USSR by the Zavitinskoye deposit in the eastern Transbaykal. The pegmatite veins, exploited for a period of over 10 years, are of considerable thickness and run for many hundreds of meters. Individual veins are traced in strike up to 1,500 meters. Lithium minerals are represented mainly by spodumene, and also by petalite and amblygonite.

Pegmatites of this deposit show definite signs of passing through pneumatogenic processes as revealed by the presence of greisens. The thickness of greisenized portions in certain veins varies from 0.4 to 20 meters. By a number of common features the Zavitinskoye deposit approaches in its genetic type the Etta deposit of the Black Hills region in South Dakota.

The second type of lithium deposit is represented by pneumatolytic veins of the tin-wolfram group, containing zinnwaldite. Deposits of this type are few and commercially insignificant. In Czechoslovakia, the tin-bearing veins of Zinnwald, rich in feldspar, contain a large amount of zinnwaldite with a low concentration of lithium, 1-1.2%. Similar deposits occur in Saxony.

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The third type includes the waters of mineral springs and brines in which lithium is concentrated jointly with sodium, potassium, boron and other salts.

In the USSR, this type of lithium concentration has been detected in many places, for example, jointly with alkalies in numerous salt lakes of Western Siberia. Study of inland salt lakes of the Aral-Caspian depression reveals accumulation of lithium in these lakes. Mineral springs of the Caucasus, Transbaykal, and other areas also show the presence of lithium.

There are no generally established standards for lithium ores or concentrates. Therefore, evaluation of the quality of these ores is usually done on the basis of industrial experience, small for the time being, gained by mining deposits already in exploitation.

Spodumene and zinnwaldite are found sometimes in the form of large crystals whose size permits obtaining commercial concentrates by hand picking. Their content in rocks is greatly varied even within a single deposit.

More frequently, lithium minerals are characterized by small size, and their extraction from ores requires mechanical concentration. Technical literature gives no adequate data on the lithium content in such ores but, obviously, it is also quite divergent in this case.

Scarcity of natural economically sound concentrations of lithium minerals requires of geologists the most accurate registration of each finding of such minerals. This is especially important in the light of the fact that a variation of their content in rocks may give unexpectedly favorable results during subsequent prospecting.

Prior to the revolution, all requirements for lithium products in Russia were covered exclusively by import, mainly from Germany. At present, a number of lithium deposits in the USSR, mainly in the form of spodumene and lepidolite, are being studied in detail. Domestic production of lithium preparation and compounds entirely satisfies demands of the national economy for these products.

The following table presents the chemical composition of lithium minerals from such deposits of the USSR.

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| Name of Mineral and Deposit | SiO 2 | Al O 2 3 | K O 2 | Rb O 2 | Cs O 2 | Li O 2 | Na O 2 | CaF 2 | Fe O 2 3 | MnO | CaO | MgO | H O 2 |
|---|----------|-------------|----------|-----------|-----------|-----------|-----------|----------|-------------|------|------|------|----------|
| Lepidolite | | | | | | | | | | | | | |
| Lipovskoye | 50.35 | 28.30 | 9.04 | -- | -- | 5.49 | -- | 5.20 | -- | 1.23 | -- | -- | -- |
| Gora Voron- chikha | 50.80 | 25.25 | 9.84 | -- | 2.04 | 5.31 | 1.91 | 5.22 | 0.05 | -- | 0.25 | 0.20 | 0.71 |
| Yuzhakovo (Ural) | 50.96 | 22.20 | 11.39 | -- | -- | 5.55 | 0.54 | 8.71 | -- | 5.38 | -- | -- | -- |
| Savateyevskoye (from tailings heap) | 51.50 | 24.35 | 6.31 | 0.40 | 0.29 | 1.29 | 2.21 | -- | 0.70 | 4.36 | 0.12 | 4.36 | -- |
| Spodumene | | | | | | | | | | | | | |
| Zavitinskoye | 53.53 | 27.88 | 0.29 | -- | -- | 0.92 | 0.95 | -- | 0.28 | 0.11 | 0.21 | 0.02 | 0.06 |

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